Trauma Surgery Registry Report

May 2013 - April 2014

Trauma Surgery Unit
Department of Surgery
Hospital Sultanah Aminah Johor Bahru
Johor

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Executive Summary

This is the third Trauma Surgery Registry report analysing trauma patients managed by Trauma Surgery Unit of Hospital Sultanah Aminah, Johor Bahru from May 2013 to April 2014. This series does not include pure neurotrauma and orthopaedic trauma, similar to the scope of patient admissions dealt with in the previous two reports.

The following are the highlights of the report :

1. There were 753 admissions, which was a 2% decrease from the previous year with 769 admissions. Almost a third (31.5%) were cases referred from other KKM hospitals in Johor.

2. Major trauma (ISS score > 15) comprised of more than half (52.9%) of the cases admitted.

3. Young males (21 - 40 year olds) form 43.8% of all admissions, and majority of them were involved in blunt trauma following road traffic accidents.

4. Motorcycle crashes were the main aetiology (73.4%) among those involved in road traffic accidents.

5. Proportion of trauma surgery patients admitted to ICU in this report reduced to 32%, from previous year with 36%. Of these ICU admissions, mortality rate was 23.7%, slightly reduced from previous year with 24%. Average length of stay in ICU stayed the same at 8.37 days.

6. The mortality rate of all trauma surgery admissions was 9.8%, which was reduced compared to 11.6% of previous year. Among the trauma cases admitted into ICU, which were all major trauma of ISS>15, mortality rate increased to 23.7%. A small subset of patients with severe injuries which triggered trauma alert activation at the Emergency Department had a correspondingly high mortality rate of 33.3%, an improvement from previous year report of 47.1%. This group remains a challenge in management.

7. Survival outcome based of Revised Trauma Score (RTS), Injury Severity Score (ISS), and Probability of Survival (Ps) by Trauma and Injury Severity Score (TRISS) were comparable to previous year report.

8. Of those who survived, their Functional Independence Measure Scale (FIMS), a functional outcome assessment instrument, showed a good outcome which was comparable to report of previous year. Summary

1 March 2016

State of Johor

Introduction

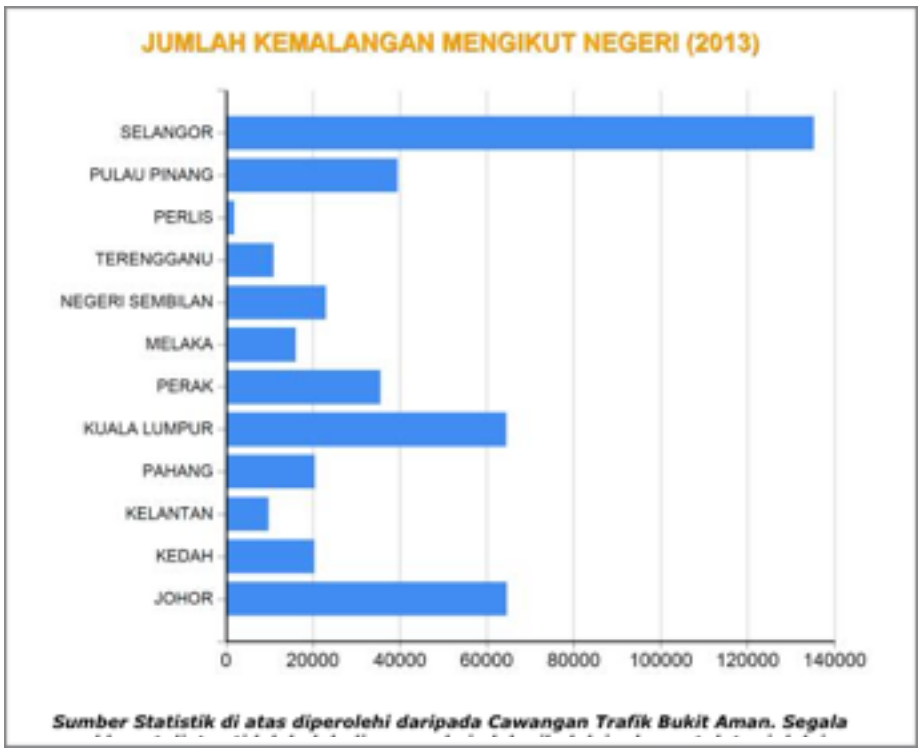
The Trauma Surgery Unit was established as a subspecialty under the Department of Surgery, Hospital Sultanah Aminah, in March 2011. The unit is staffed by a Consultant Trauma Surgeon, a Trauma Surgeon, a Fellow Trauma Surgeon, a Trauma Coordinator and Nurse, a registrar/medical officer and a house officer on a rotational basis. Besides clinical aspects of patient care, the unit is also heavily involved in other aspects of trauma care, such as, in-hospital systems development, training and education of Specialist Fellows, doctors and nurses, as well as registry data collection, processing and audits.

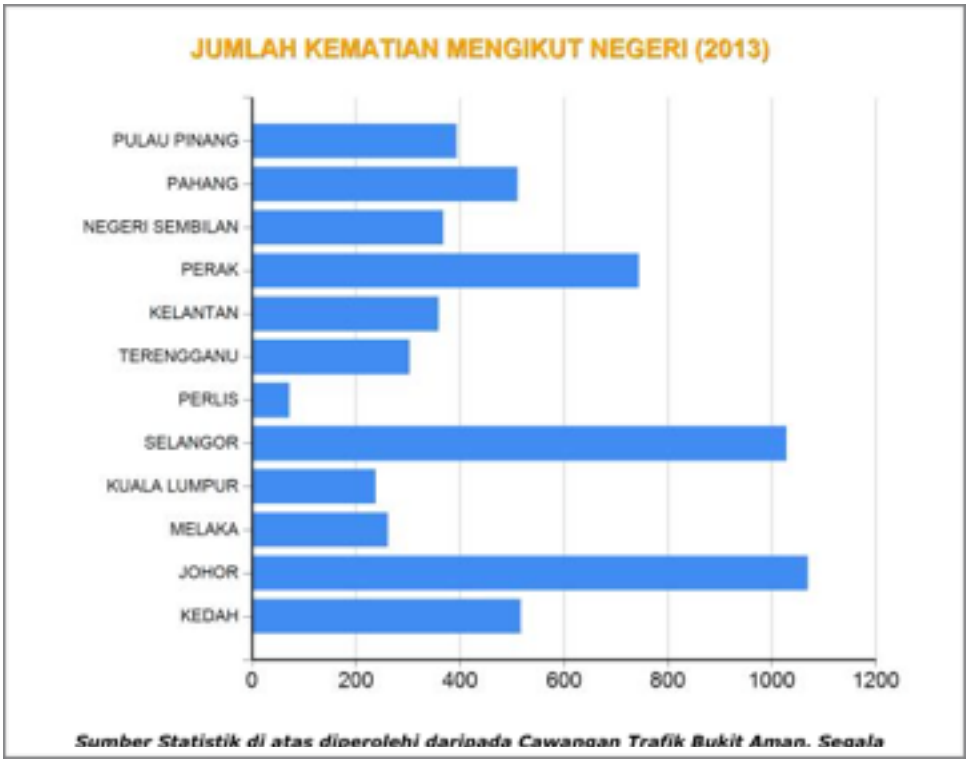
This unit has been entrusted to train the Master of Emergency Physician candidates from UKM and UM on a 6 weeks rotational basis since 2014. The Unit has trained more than 35 Emergency Physician candidates since 2014.

The trauma registry started data acquisition in May 2011. This is the third report of the registry, for the period of May 2013 ending April 2014.

Overview of Road Traffic Accident in Malaysia

According to the statistic by Polis Diraja Malaysia in 2013, they have recorded 442,206 Road Traffic Accidents in the country excluding East Malaysia. Selangor has the highest recorded RTA in that year (135,228), followed by Johor (64,696) and Kuala Lumpur (64,552). Deaths due to RTA is also high among these two states, Johor at 1070 deaths in 2013, followed by Selangor at 1028 deaths. This explained the high number of trauma cases managed by major hospital of these two states.





Overview of HSAJB Trauma Registry

Data Capture and entry

Data from the following were captured for entry into the registry:

- All adult trauma patients admitted to the Department of Surgery, Hospital Sultanah Aminah, whether directly or referred from other hospitals.
- All other adult trauma patients referred to the Trauma Surgery Service of the Department of Surgery, from other Departments/ Services within Hospital Sultanah Aminah.

Data is entered by a dedicated staff member. It is kept and processed with a statistic programme configured to the needs of the registry.

Definitions

This registry *EXCLUDES*:

a. Injury resulting from pathological conditions (i.e pathological fractures resulting from malignancy) and injury resulting from degenerative changes or medical illnesses.

b. Hanging, drowning, burns and envenomation.

c. Very late presentations or transfers or referrals from other hospitals for conditions not as a direct result of the initial trauma insult where definitive treatment had been accomplished in the hospital of origin (i.e bowel obstruction following a laparotomy performed for trauma) or sequelae of complications occurring temporally distant from the index injury.

d. Isolated head and/or isolated skeletal fractures.

"Major Trauma"

The only globally accepted definition of "Major Trauma" are injuries with an ISS of more than 15. Subsequent additional criteria vary by institutions and regions. The criteria used for "major trauma" for Hospital Sultanah Aminah is as below:

- All adult trauma patients with an Injury Severity Score of more than 15 and/or,
- All adult trauma patients in the care of the Trauma Surgery Service requiring admission to the Intensive Care Unit (does not include Neurosurgical HDU).
- Trauma patients who die in the Emergency Department having been brought in with signs of life.
- All hemodynamically unstable pelvic fractures requiring surgical/radiological hemostatic intervention.

Injury Severity Score (ISS) and New Injury Severity Score (NISS)

ISS is an anatomical score used to quantitatively assign the severity of multiple injury. Each injury is assigned an Abbreviated Injury Score (AIS) and only the highest AIS within a certain body region included in the final calculation. There are five body region divisions and the top 3 scoring injuries are identified. Each of these 3 AIS scores are squared and the sum total constitutes the ISS (Baker et. al., 1974)[2]. In this report, where "ISS" is stated, it was calculated with the **NISS principle** (Osler, 1997)[3].

Abbreviated Injury Score (AIS)

The AIS is a score weighted on the severity of injury to a given anatomic organ. It is graded 1 to 6 in ascending severity, 6 being unsurvivable. The AIS for solid organs are coded according to AAST (American Association for the Surgery for Trauma) guidelines, 1990. All other AIS scores are clinician subjective. For this registry, the AIS scores were decided and assigned to an injury by cross referencing at least two or preferentially three sources of information, which are, radiological data (X-rays and scans), operative notes and communication with the operating team surgeon/s.

Revised Trauma Score (RTS)

The Revised Trauma Score is a physiologic severity score that can be a useful triage tool and is an accurate predictor for the probability for survival. This score assigns coded values for 3 parameters, namely the first recordings of the Glasgow Coma Scale, systolic blood pressure and respiratory rate as below;

Glasgow Coma Scale (GCS)	Systolic Blood Pressure (SBP)	Respiratory Rate (RR)	Coded Value
13-15	>89	10-29	4
9-12	76-89	>29	3
6-8	50-75	6-9	2
4-5	1-49	1-5	1
3	0	0	0

RTS = 0.9368 GCS + 0.7326 SBP + 0.2908 RR

Values range from 0.00 to 7.84. The higher the RTS value, a higher probability for survival is expected. The values used for calculation are that obtained from the first recorded values in the emergency department.

TRISS

TRISS, combines both ISS and RTS to give a probability of survival (Ps) for a given patient. It is derived from the formula as shown below:

$$Ps = 1/(1+e^{-b})$$

Where b = b0 + b1(RTS) + b2(ISS) + b3(Age Index)

The coefficient b to b3 are derived from multiple regression analysis from data obtained from the Major Trauma Outcome Study (MTOS), these coefficients are different for blunt and penetrating injuries. Age Index is 0 if the age is below 55 years and 1 if 55 years or more. If the patient is below 15 years old, blunt coefficients are used regardless of mechanism.

	Blunt	Penetrating
b0	-0.4499	-2.5355
b1	0.8085	0.9934
b2	-0.0835	-0.0651
b3	-1.743	-1.136

The Functional Independence Measure Score (FIMS)

The FIM score is a functional outcome score that measures the patient in four areas, which are self care, mobility, communication and social cognition. Each of these areas are subdivided into smaller subdivisions and are given 7 score levels, which will subsequently be totalled for each area. Patients are scored by nursing staff just before hospital discharge.

Self Care

No	Activity	Score	Due to Injury ?
1	Eating		Y/N
2	Grooming		Y/N
3	Bathing		Y/N
4	Dressing - upper		Y/N
5	Dressing - lower		Y/N
6	Toileting		Y/N
7	Bladder		Y/N
8	Bowel		Y/N
	Total		

Mobility

No	Activity	Score	Due to Injury ?
9	Transfers (bed/chair/wheelchair)		Y/N
10	Transfers (Toilet)		Y/N
11	Transfers (bath/ shower)		Y/N
12	Walk/wheelchair		Y/N
13	Stairs		Y/N
	Total		

Communication

NO	Activity	Score	Due to Injury ?
14	Comprehension		Y/N
15	Expression		Y/N
	Total		

Social Recognition

NO	Activity	Score	Due to Injury ?
16	Social Interaction		Y/N
17	Problem Solving		Y/N
18	Memory		Y/N
	Total		

FIM Levels

1. Total assistance (subject <25%)
2. Maximal Assistance (subject 25 % - 50 %)
3. Moderate Assistance (subject 50%-75%)
4. Minimal Assistance (subject > 75%)
5. Supervision only (subject 100%)
6. Modified Independence (usage of aid devices)
7. Complete independence.

Emergency Department HSAJB

Figure 1 : Emergency Department Attendance 2013-2015

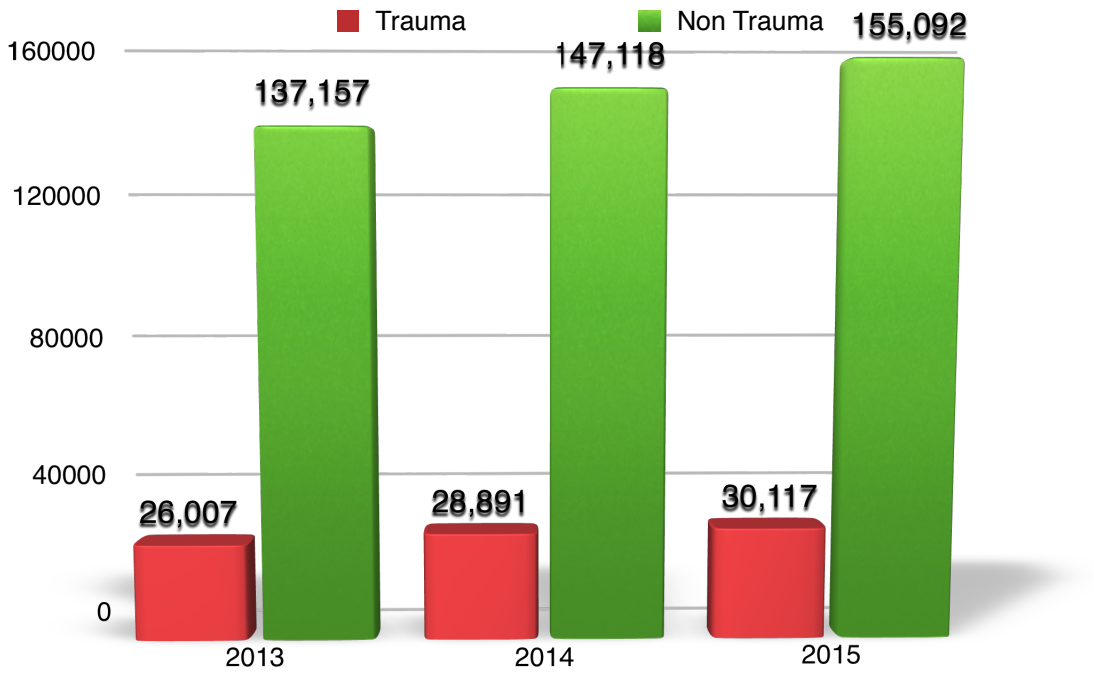


Figure 2 : Trauma Cases Presented to ED at different Zones from 2013 - 2015.

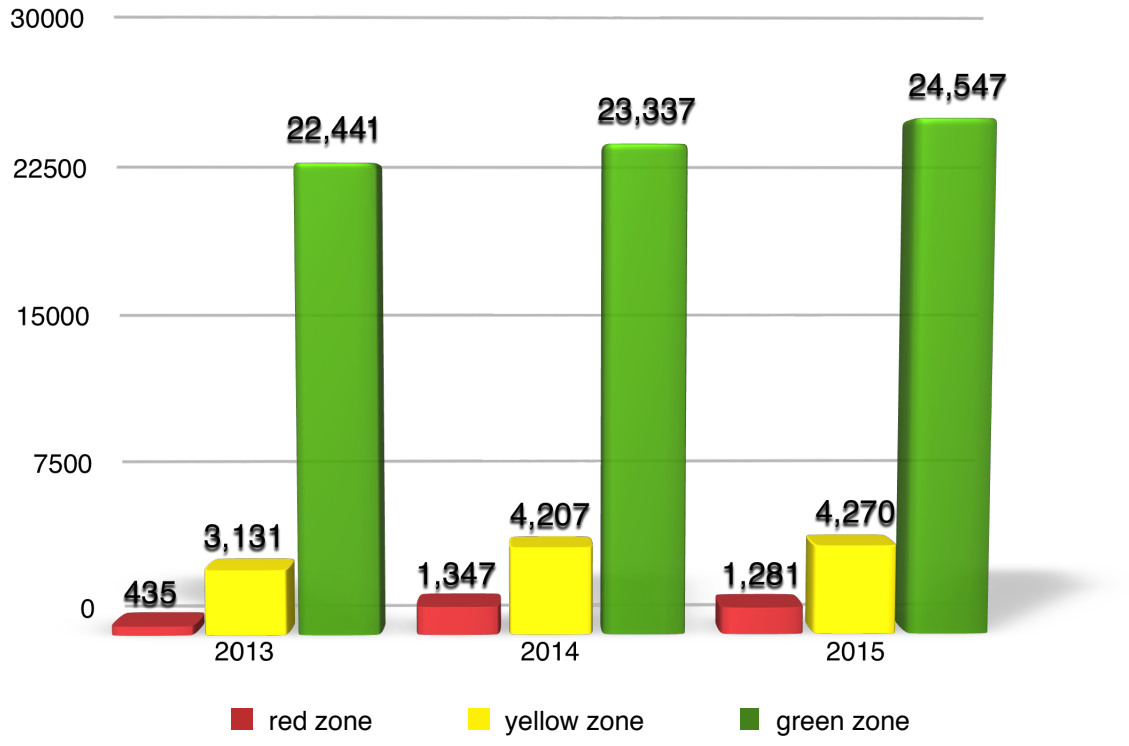
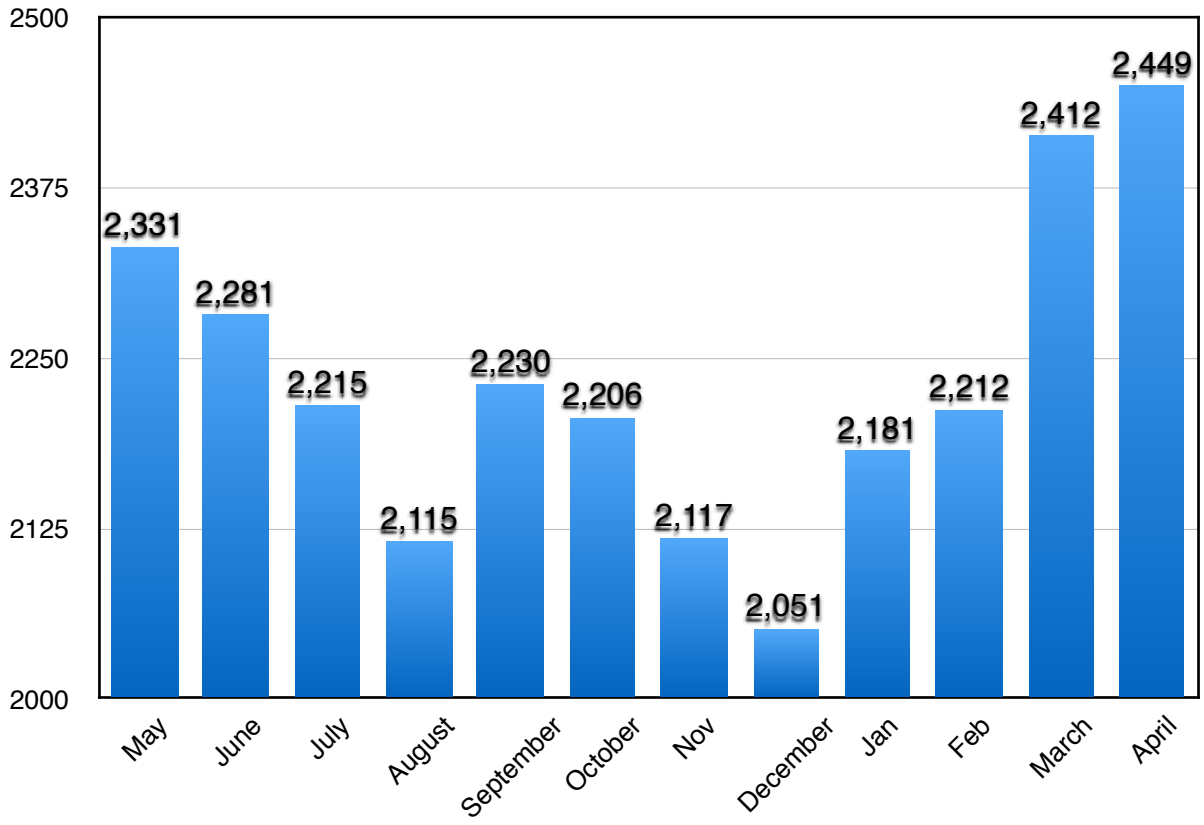


Figure 3 : Monthly Distribution of Trauma Cases Presented to Emergency Department from 2013-2014.



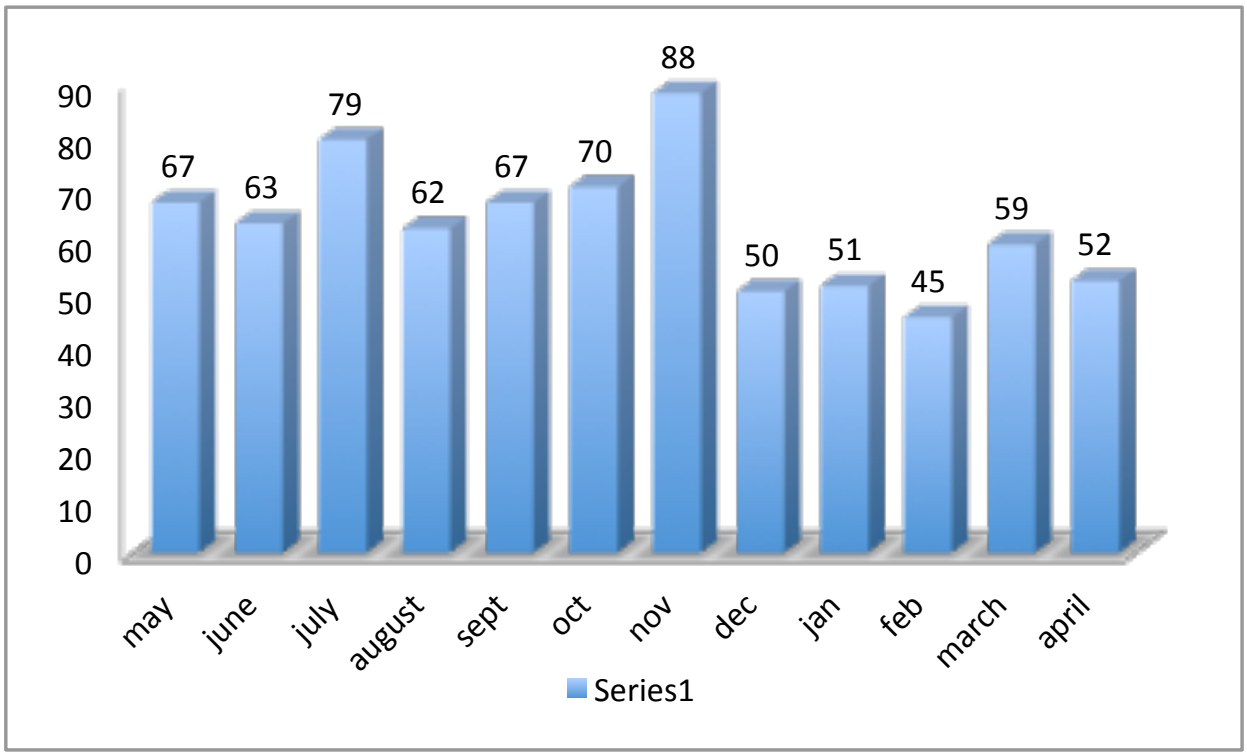
From 2013 until 2015, Emergency Department Hospital Sultanah Aminah received about 135000 cases a year and about 19% of them were trauma cases. The number of trauma cases attended at the Emergency Department has never drop since 2013. Majority of them sustained minor trauma, treated at the green zone and were discharged home. About 16% sustained moderate to severe injury that were attended in the red or yellow zone of our Emergency Department. This also include patients that were transferred from other hospital or institutions. Most of the moderate to severely injured patients were admitted to the respective units such as Trauma Surgery Unit, Orthopaedic, Neurosurgery and ENT departments. On average, about 2233 trauma cases presented to our ED every month from May 2013 until April 2014. About one third of these patients were seen and managed by the Trauma Surgery team and the rest were managed by the respective disciplines according to their injuries.

HSAJB Trauma Registry Report 2013-2014

Part 1 General Data

Admissions 2013-2014

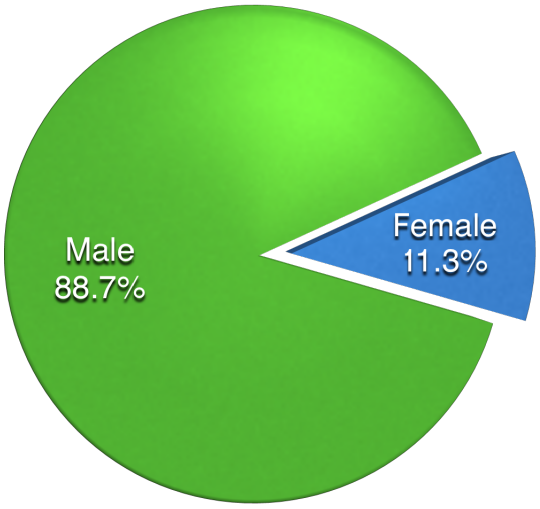
Figure 4 : Admissions May 2013 - April 2014



Eventhough the numbers of trauma cases seen at the Emergency Department was more than 26000 cases a year, only 753 cases were admitted to this unit in year 2013 as compared with 769 admissions during the 2012-2013 period. This represents a 2.1% reduction in number of admissions. The remaining cases were either discharged home or were admitted to the respective unit based on their injuries. There was an average of 63 admissions per month and major trauma comprised of 53.0% of total admissions.

Gender Distribution

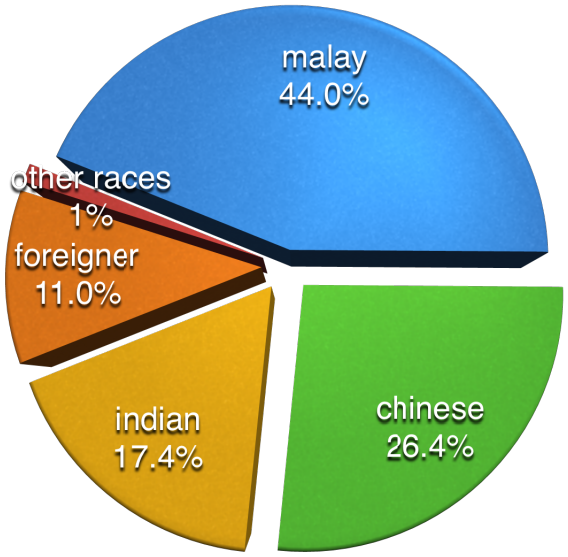
Fig 5 : Gender Distribution



The gender distribution in this report was very similar to the report of previous year in which males still dominated the admissions at 88.7%, as compared to 87.5% in the previous year.

Ethnicity Distribution

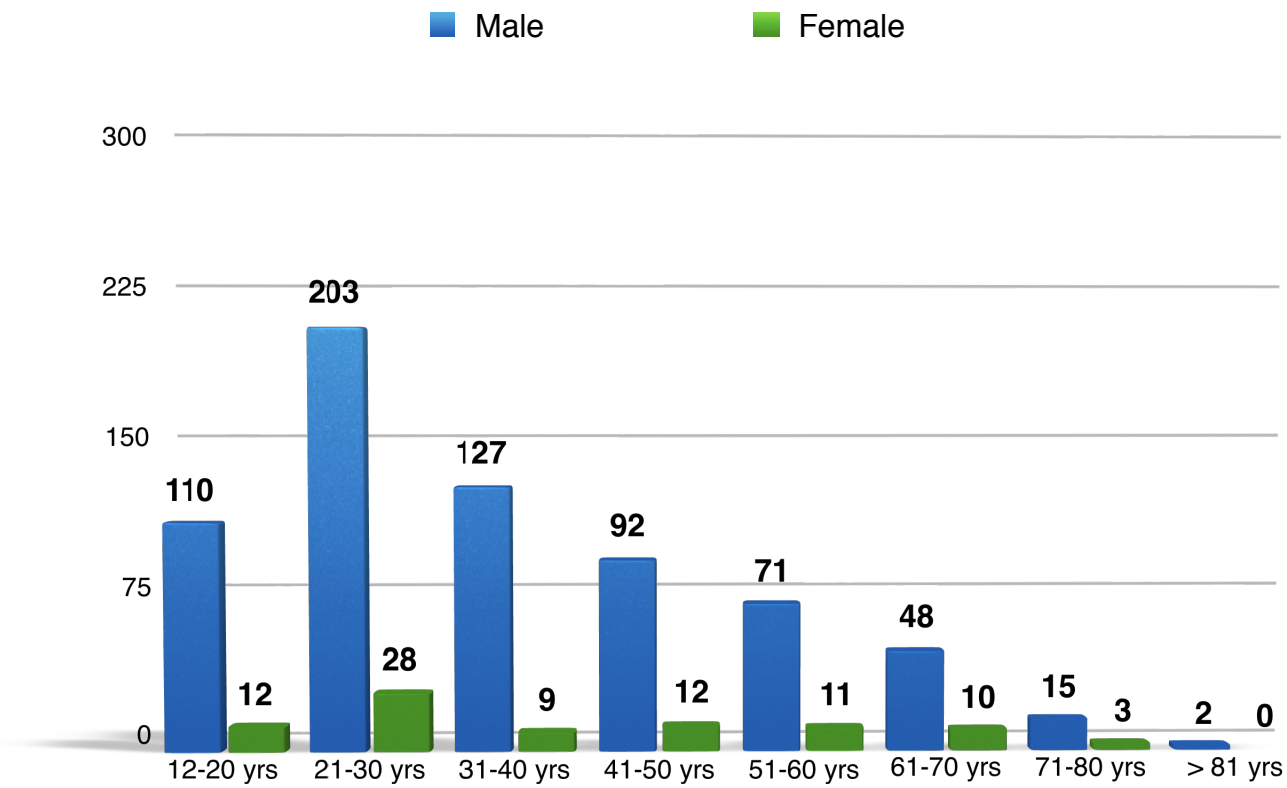
Fig 6 : Ethnicity Distribution



Among the three major races in Malaysia, Malay/Indigenous people comprised the majority of the admissions followed by Chinese and Indians. The proportion of Malay patients admitted had dropped slightly compared with report of the previous year (47.1%). We received a significant number of admissions among foreign nationals who were mainly injured due to work related accidents (11.0%).

Age Distribution

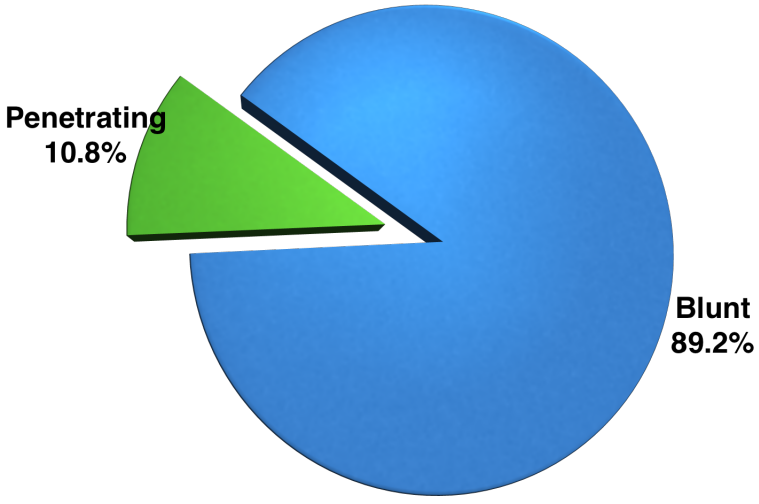
Figure 7 : Age Distribution



Young males in age group of 21-40 years formed the majority of the cases. The distribution in all the other age groups was very similar with the admission pattern of previous year. There were only two patients aged more than 80 year old as compared with six cases in a year before.

Trauma by Mechanism

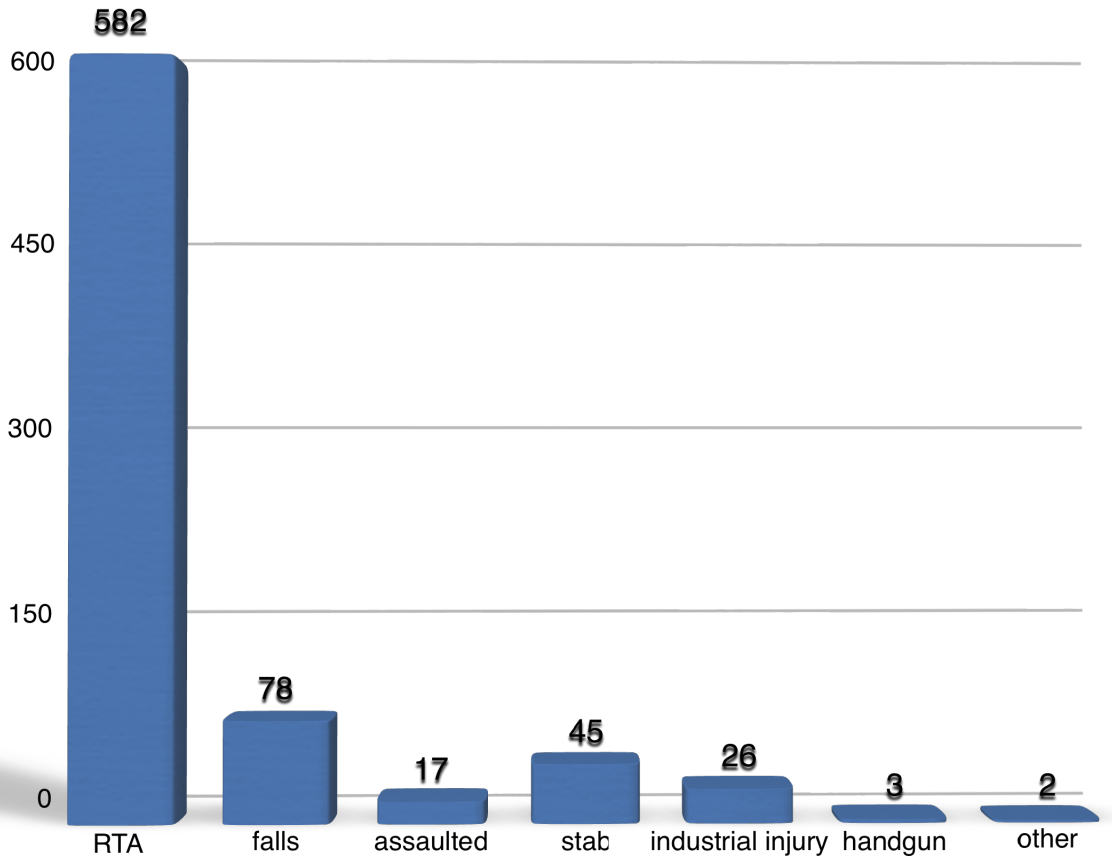
Figure 8 : Trauma by Mechanism



Blunt trauma was the mechanism of injury sustained in almost 90% of cases admitted to the unit. Majority of these cases involved road traffic accidents. Penetrating injuries showed an increase in proportion (10.8%) as compared with report of previous year (8.8%).

Trauma by Cause

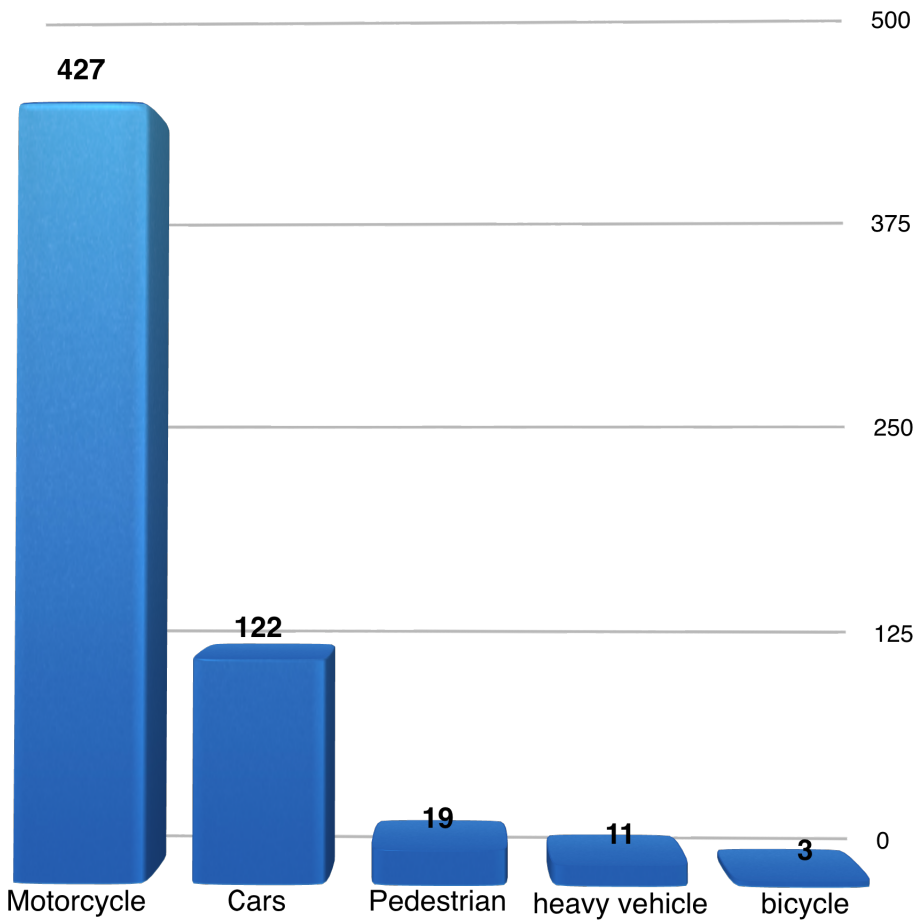
Figure 9 : Trauma by Cause



Road traffic accident (RTA) is still the leading cause of admission making up 77.3%. Fall from height contributed to about 10.3% of admissions.

Breakdown of RTA

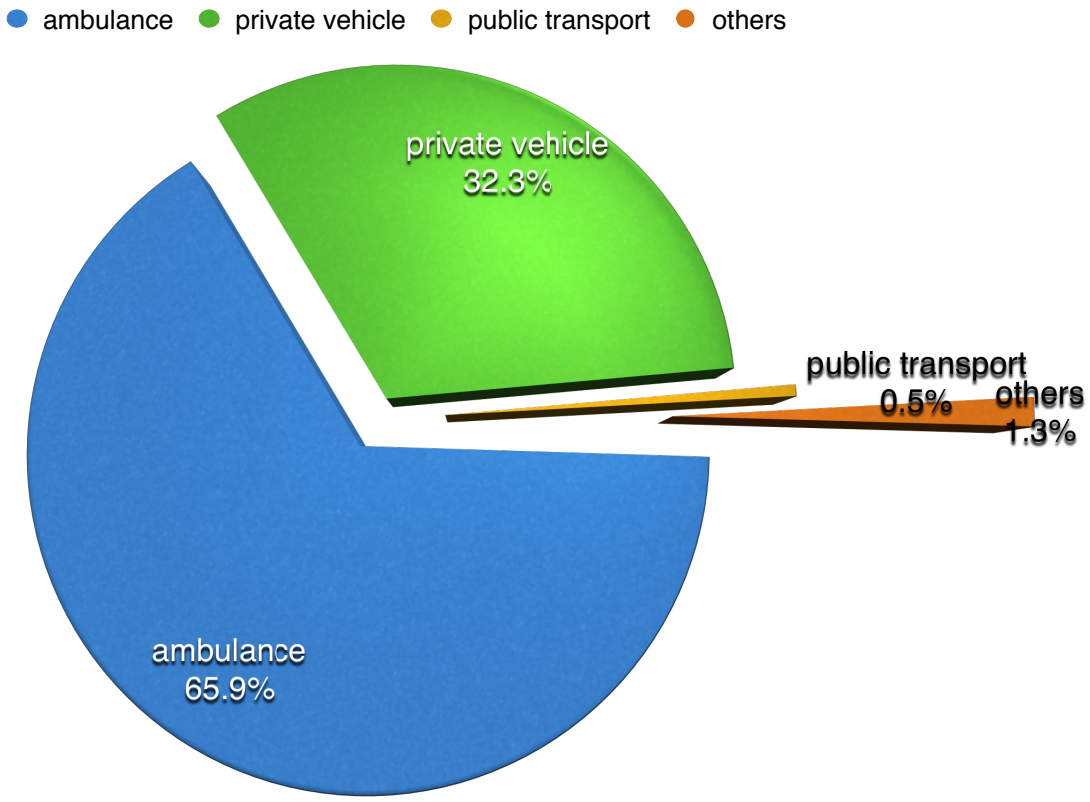
Figure 10 : Breakdown of RTA



Blunt trauma as a result of RTA formed the major mechanism of injury accounting for 77.3% compared with other mechanisms. The majority of these cases involved motorcycle crashes, contributing to 73.4% of injuries.

Mode of transport to hospital

Figure 11 : Mode of transport to hospital



The majority of cases (65.9%) arrived by ambulance. This percentage showed a slight drop in comparison with previous year (68.3%). These numbers were contributed largely by inter-hospital referrals which constituted 31.5%, where all of them were ambulance transfers as stipulated by inter-hospital transfer policy.

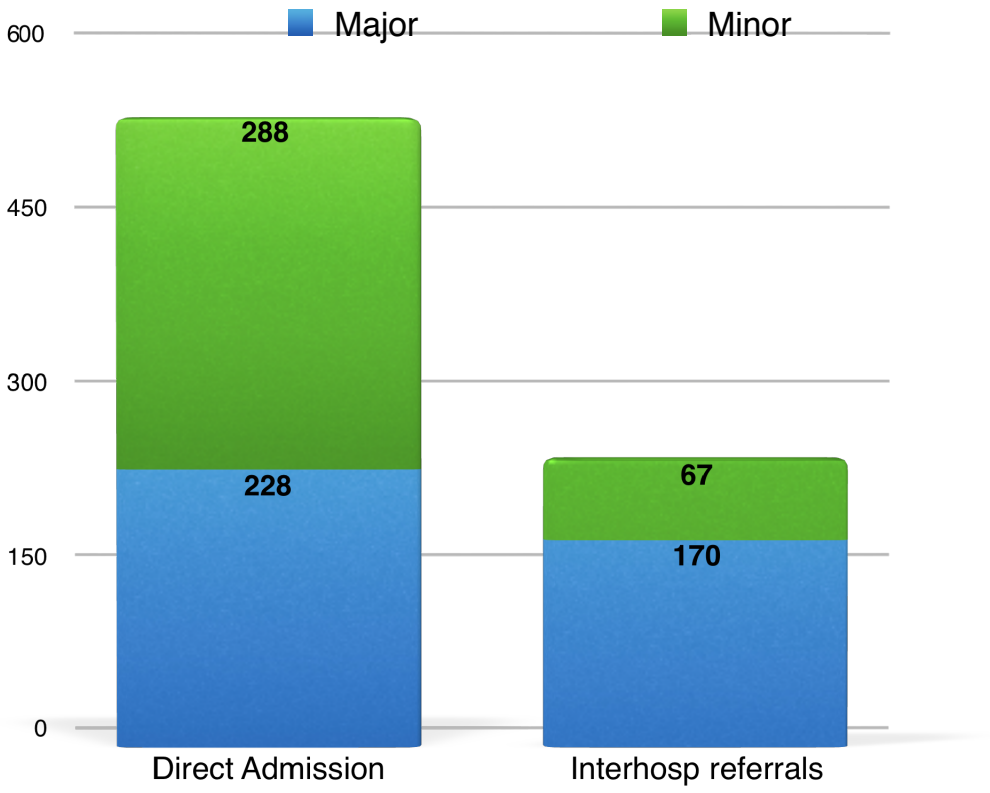
There was a tremendous jump of cases brought in by private vehicles compared with previous year from a mere 10 cases to 243 cases in this report. On the flip side, cases brought in by public transport decreased significantly, from 233 in the previous year to just 4 cases in this report. These data ought to be examined in conjunction with data that gauges end-user satisfaction of the pre-hospital service and public awareness and perception on the provision of ambulance services within our area of responsibility. This will help in the planning and improvement of pre-hospital emergency care.

ED admission

Table 1 : Source of admission

Source of patient	Total	Major Trauma
Direct admission	516	228
Interhospital referrals/transfers	237	170
Total	753	398

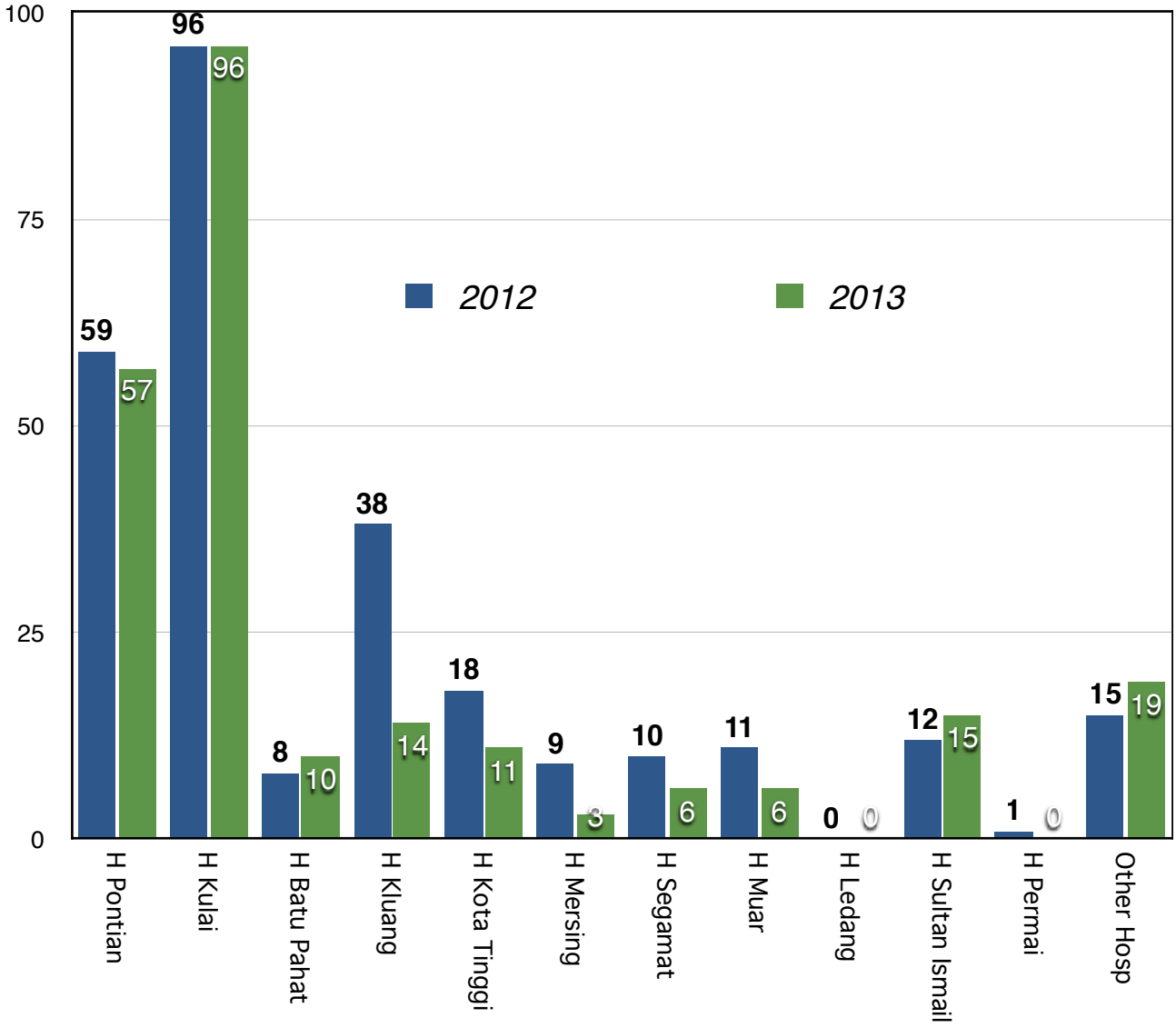
Figure 12 : ED Admission



Most trauma cases (68.5%) were direct admissions to our ED and 31.5% were referrals from other hospitals in the state of Johor. The number of major and minor injuries admitted directly were almost equal. However, approximately three quarters of referred patients were major traumas (71.7%). The large number of inter-hospital transfers, especially in cases of major trauma, reflects HSAJB's position as the apex hospital for the state of Johor.

Sources of referrals/districts

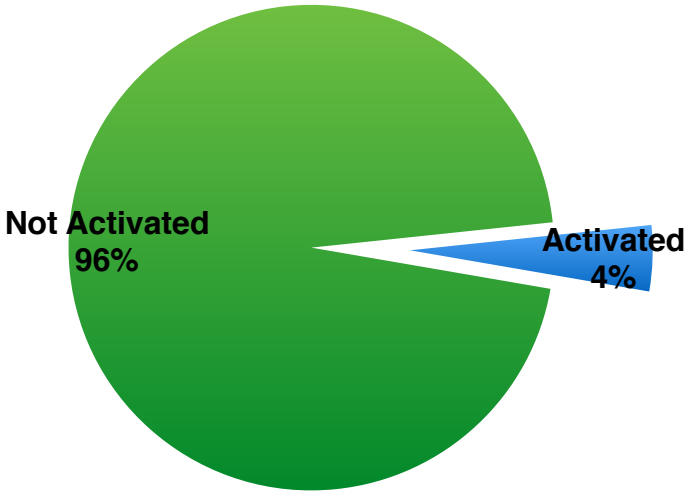
Figure 13 : Sources of Referral



HSAJB received cases from other hospitals in the state of Johor and large proportions originated from Kulai (96), Pontian (57) and Kluang (14). All three hospitals contributed to about 70% of inter-hospital referrals. Hospitals in Kulai, Pontian, Kota Tinggi and Mersing are district hospitals without specialists, thus these hospitals would refer to the nearest hospital with surgical services such as HSAJB or HSIJB. Besides HSAJB, other hospitals in Johor which provide general surgical services are Muar, Batu Pahat, Segamat, Kluang and Sultan Ismail Hospitals. However, they still refer cases to HSAJB when there are concomitant brain, vascular, complex intraabdominal and thoracic injuries. The high number of cases originating from Kulai and Pontian was a direct reflection of the heavy burden of trauma cases that presented to both hospitals.

Trauma team activation

Figure 14 : Trauma Team Activation



The Trauma Team Activation system was introduced at the end of 2011. It has 2 tiered activation whereby *full activation* during office hours, weekdays and *partial activation* after hours and weekends. The 4% figure shows an under-triage of cases. There is still room for improvement, especially in raising the level of awareness on this system amongst our ED staff. We hope that in future with maturation and increased realisation of the benefits of this system, there will be a higher level of responsiveness and less under-triaging.

Total hospital length of stay (excluding deaths)

Table 2. Total hospital length of stay (excluding deaths)

Total LOS	Days
Mean	9.59
Median	6
Range	1 - 78

The mean length of stay of trauma patients who survived was 9.59 days with a median of 6 days. There were 20 cases with one day stay in hospital. These cases constitute those with minor injuries and those whose requested to be transferred to nearby private facilities.

ICU admissions

Table 3 : ICU Admissions

Admitted	Not Admitted
241	512

Figure 15 : ICU Admission

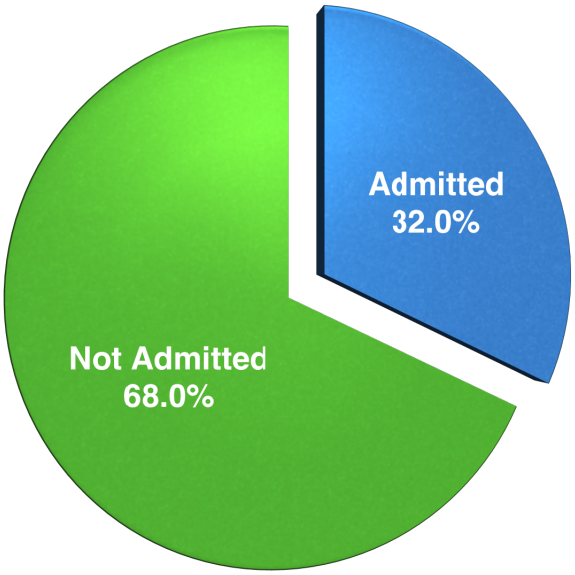


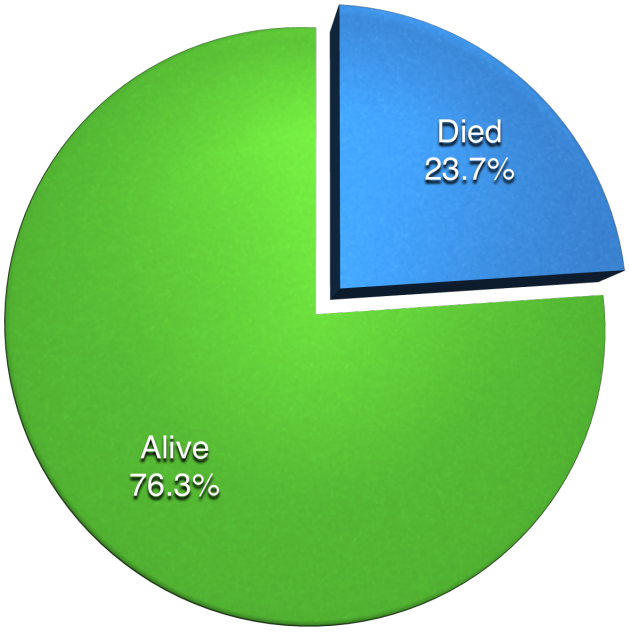
Table 4. Length of ICU stay (excluding deaths)

LOS	Days
Mean	8.37
Median	6
Range	1 - 51

About a third of cases were admitted to ICU due to severity of their injuries and majority of them sustained complex intraabdominal injuries requiring damage control surgery, severe head and chest injuries

ICU outcome

Figure 16 : ICU Outcome



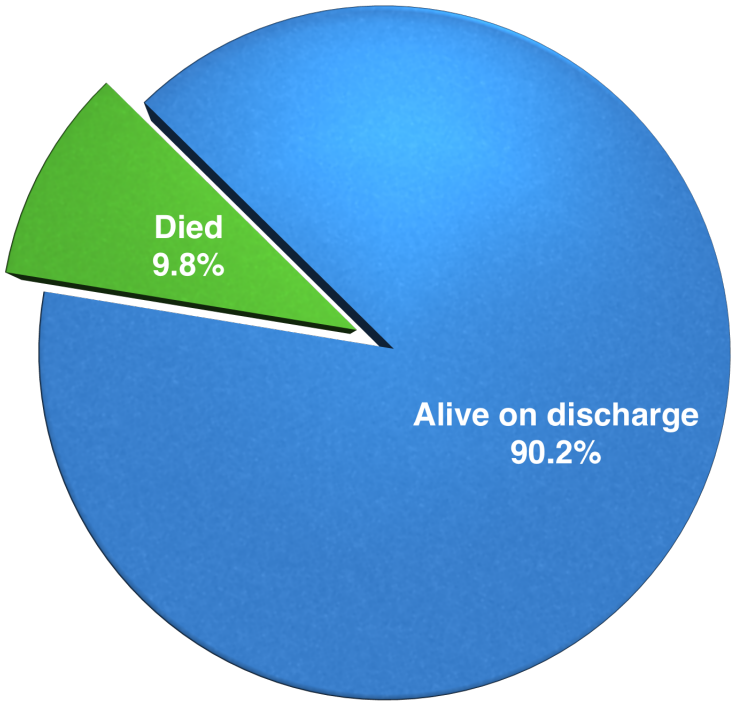
About a third of cases required admission to the general ICU, thus reflecting the severity of the cases managed by the unit. As compared to the previous year, there was a decrease of 4% in ICU admissions. The mean length of ICU stay was 8.37 days with a range of 1-51 days. Of note, the registry does not consider polytrauma cases admitted to the Neurosurgical High Dependency Unit as ICU admissions. About a quarter of the patients admitted to ICU succumbed. Of these ICU mortalities, 40.4% died of severe head injury and 23% died of sepsis.

Overall case fatality

Table 5 : Overall case fatalities

Outcome	N	%
Alive at discharge	679	90.2
Died	74	9.8
Total	753	100

Figure 17 : Overall case fatalities



The overall mortality rate has improved to 9.8% as compared with the report from previous year at 11.6%. It approximated most mortality figures in Australasian Trauma Registry Reports in the past few years.

Death by Location and Cause

Table 6. Death by location

Location	N	%
ED	7	9.5
OT	4	5.4
Wards	11	14.9
ICU	52	70.3
Total	74	100

Figure 18 : Death by Location

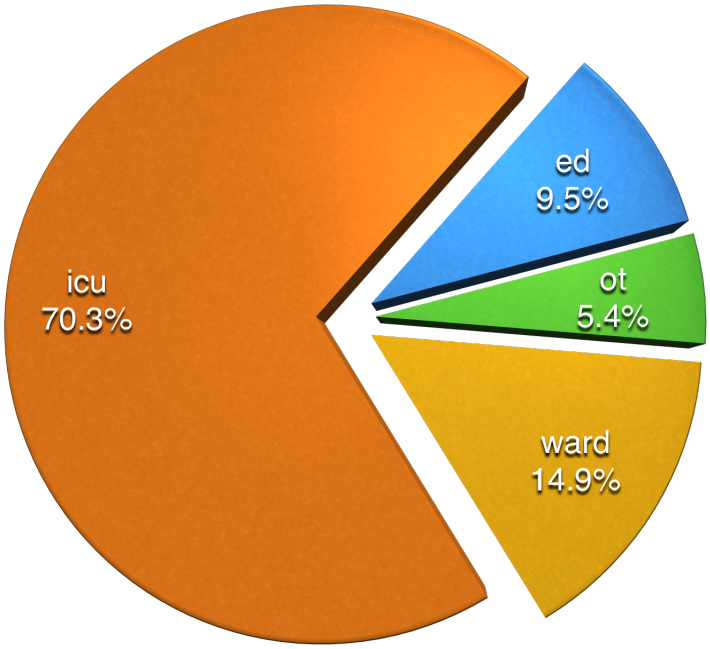
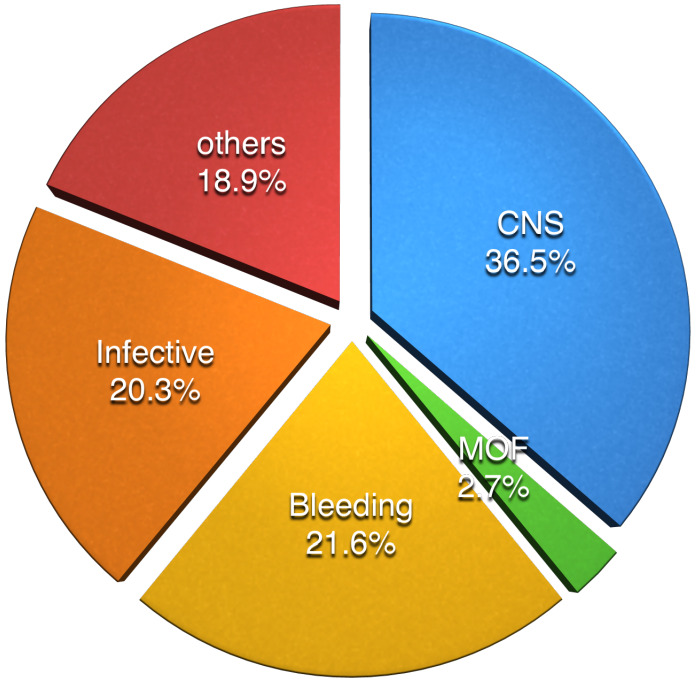


Figure 19 : Causes of Death



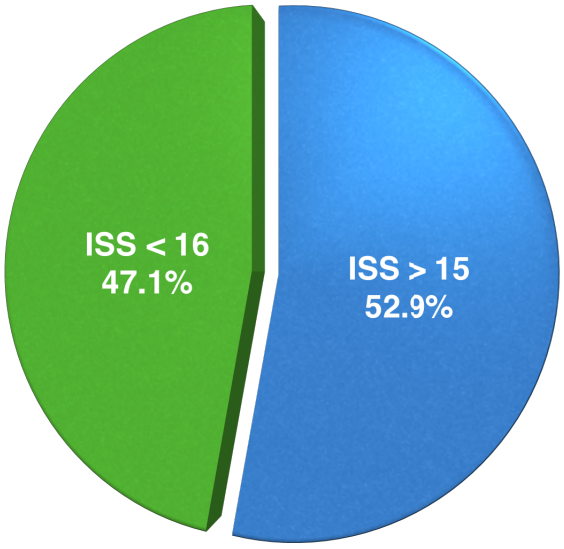
Overall, the survival rate of all trauma admissions was 90.2%, which was an improvement compared with previous years. Of those who died, the majority of the deaths (70.3%) occurred in ICU. This proportion of ICU deaths had reduced from 74.2% (66 cases) in the previous year. There were 7 deaths in ED, these cases presented “in-extremis”, with low RTS values and most of them sustained severe head injuries. Four patients died in OT as a consequences of massive uncontrolled haemorrhage. There were 11 patients who died in the wards. These wards were general surgical wards and wards of other disciplines such as neurosurgery and orthopaedic surgery.

Severe head injury was the leading cause of death followed by uncontrolled haemorrhage. Most of these cases presented with a very low RTS score and in extremis. One fifth died of sepsis and the most common cause is pneumonia due to prolong ventilation.

Part II. Major Trauma Data

Injury severity

Figure 20 : Injury Severity Score



Just well over half of all trauma patients, 398 cases (52.9%) sustained major trauma (ISS > 15). This is consistent with the fact that HSAJB is the only hospital in the state of Johor providing dedicated trauma surgical service, and also the sole hospital equipped with neurosurgical and vascular services.

Outcome of major trauma

Figure 21: Major Trauma Outcome

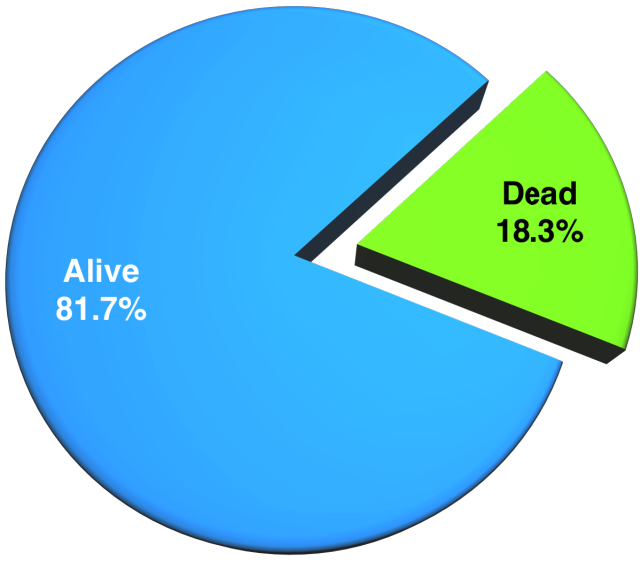
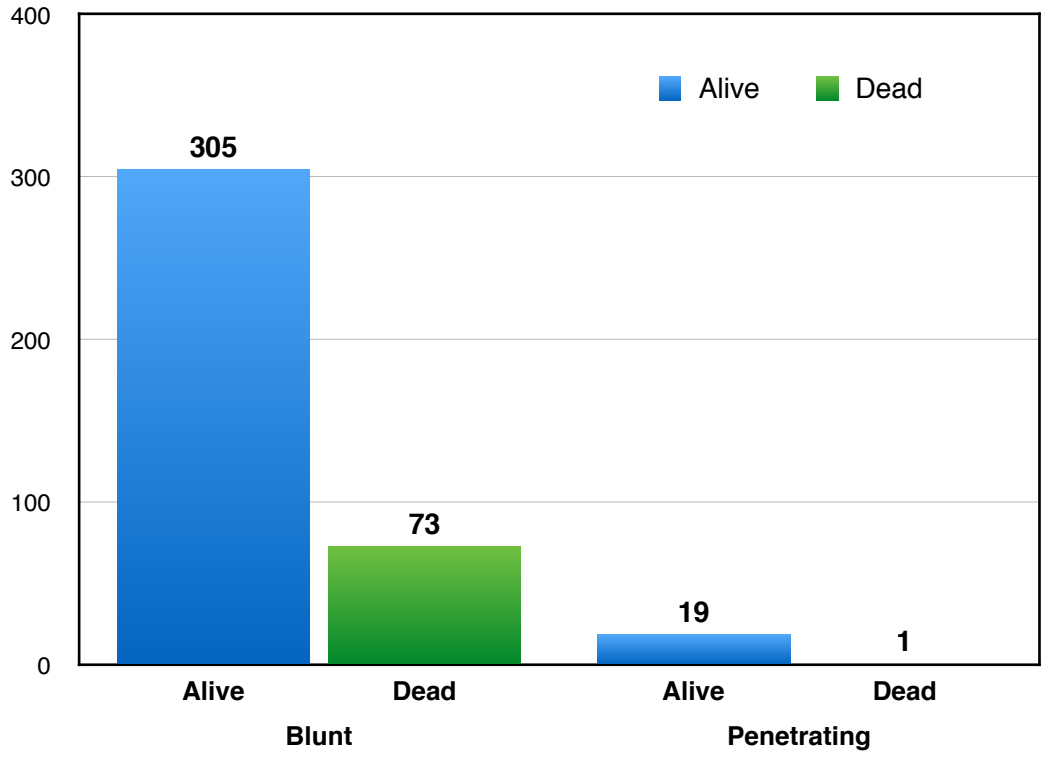


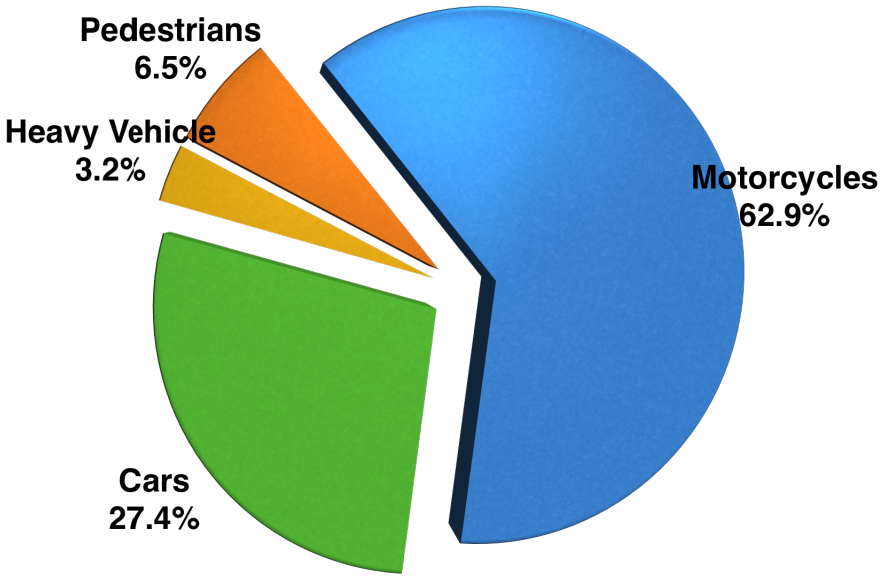
Figure 22 : Major Trauma Deaths by Mechanism (ISS > 15)



The mortality of those who sustained major trauma was 18.3% or 74 patients which showed slight improvement compared with previous report at 19.4%. Almost all of the mortality (98.6%) was attributed to blunt trauma and 41.9% were cases referred from other hospitals.

RTA Deaths

Figure 23 : RTA Deaths ISS > 15



Among those involved in a RTA and sustained major trauma, an overwhelming majority of deaths (62.9%) occurred amongst motorcyclists (either riders or pillion riders) who constituted the bulk of trauma patients involved in RTA.

Table 7 : Major Trauma Length of Stay (days) excluding deaths

ISS	Mean	Median	Range
16 - 24	11.5	8	1 - 78
26 - 40	15.8	12	1 - 77
41 - 75	20.7	19	1 - 77

The largest group of patients were within the ISS group of 16 - 24 and had a corresponding shortest duration of stay. As expected the more severe the injury (the higher the ISS values), the longer the duration of stay in hospital. This also correlates with other outcome measures such as mortality. There was an increase in mean LOS in the ISS group 16 - 24 as compared with report of the previous year (9.9). However the mean LOS for the ISS of 26-40 and 41-75 have reduce from 16.2 to 15.8 and 24.9 to 20.7 respectively. All major cases stayed less than 78 days indicating that the quality of care has generally improved especially for those who sustained the most severe injuries.

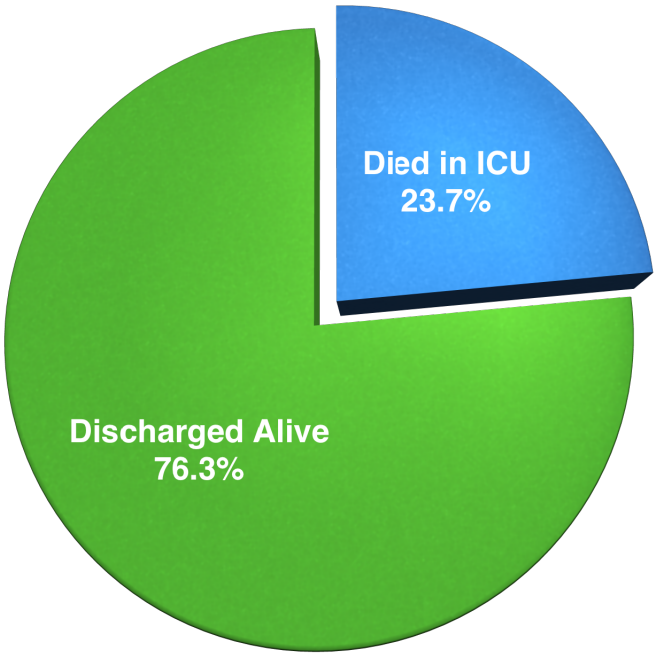
Part III. Outcomes

ICU mortality for major trauma

Table 8 : ICU Mortality for Major Trauma

Alive	Died	Total
184	57	241

Figure 24 : ICU Deaths (ISS>15)



There were 241 admissions for major trauma to ICU. Of these, about a quarter (23.7%) of them died mainly as a consequences of severe head injury and sepsis. The percentage of mortality has improved as compared to the report of previous year at 25.3%. These cases tended to be the most severely injured with higher ISS values.

Table 9 : Outcome by source of admissions and severity of injury

Source	Total	Severity		Deaths
Direct admission	516	Major	228	43
		Minor	288	0
Referrals and transfers	237	Major	170	31
		Minor	67	0

Figure 25 : Outcome by source of admission

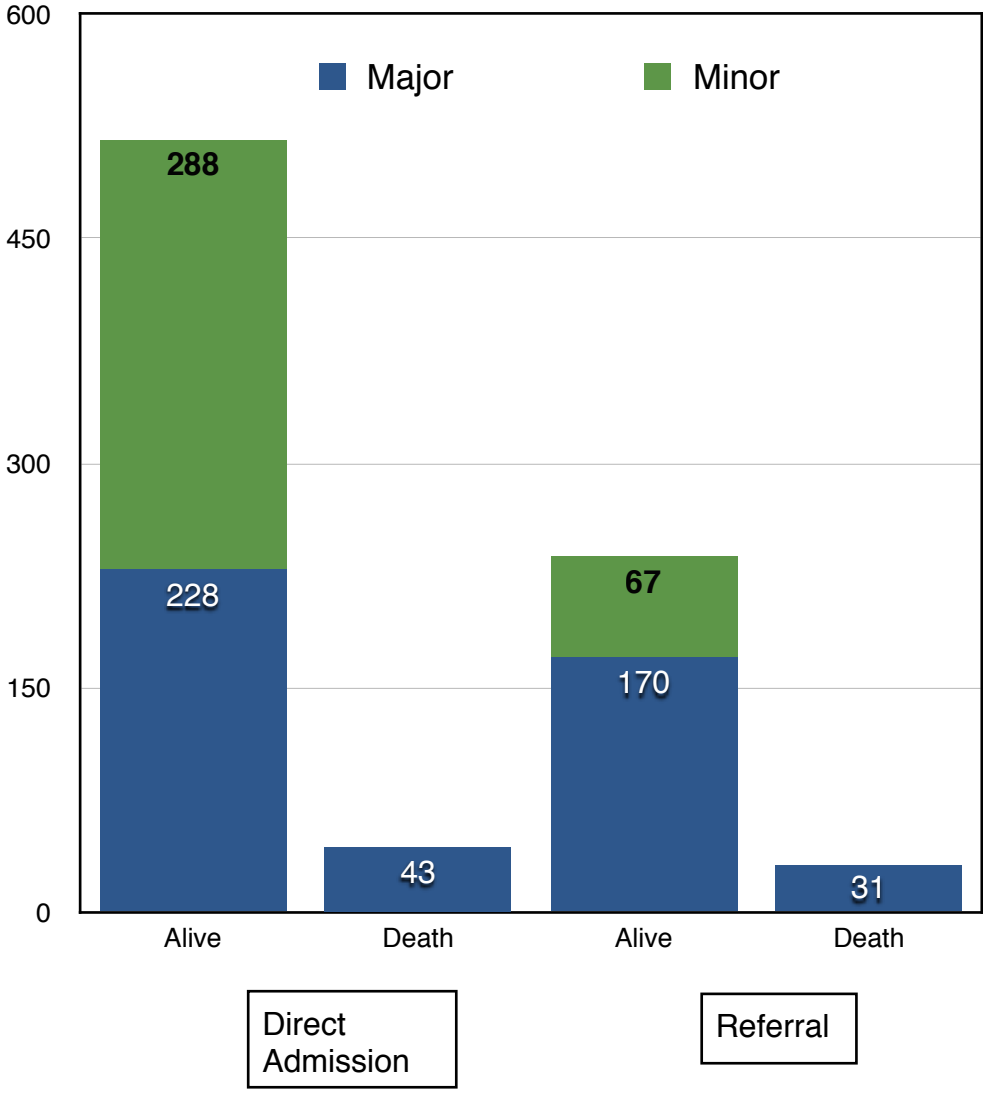
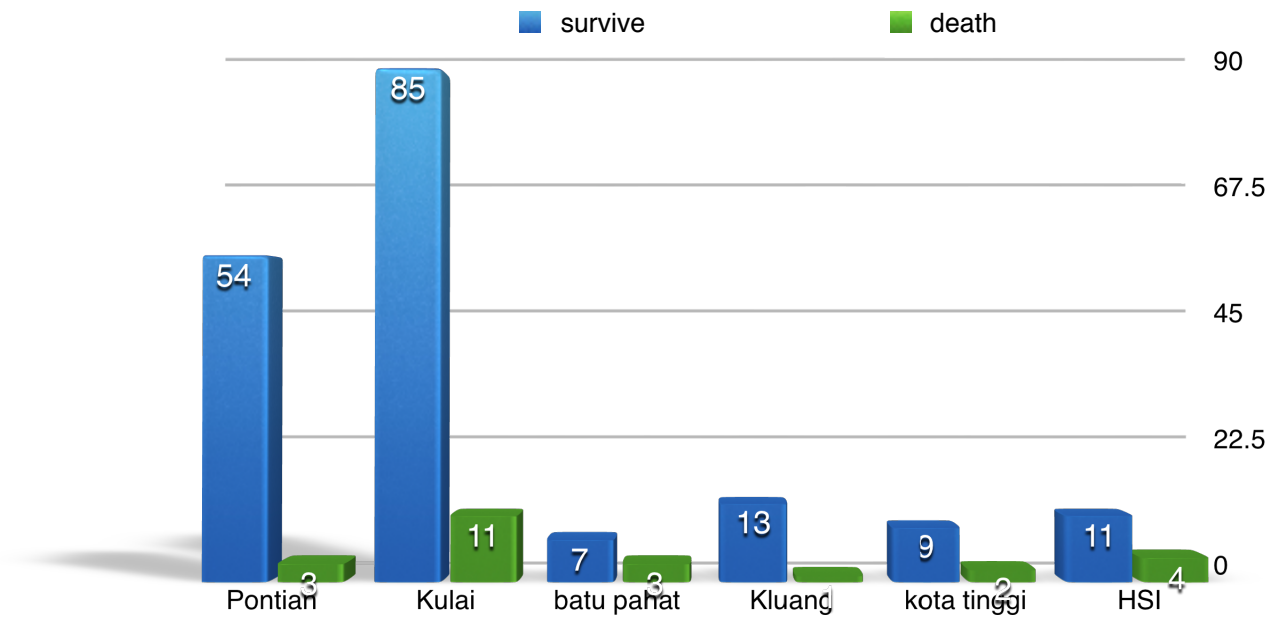


Figure 26 : Main Source of Referral and survival rate

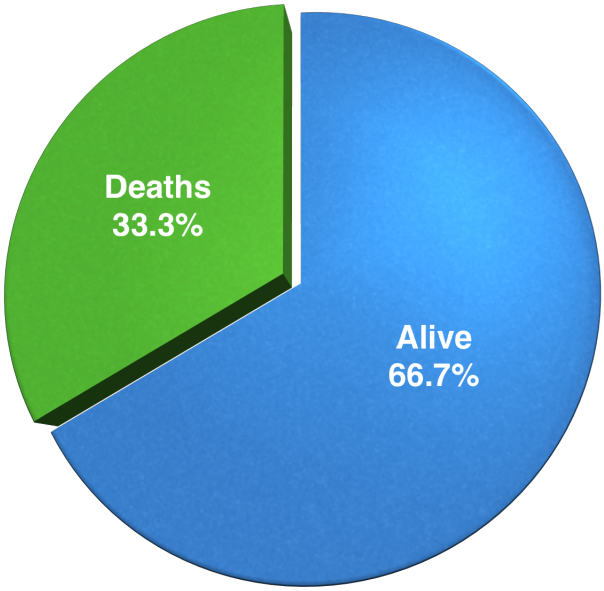


The majority of patients (68.5%) were admitted directly to the ED and 55.8% of them had minor injury. Furthermore 91.7% of them survived until discharge. Whereas, nearly three quarters (71.7%) of referred cases had major trauma and 86.9% survived. The survival rate for referred cases had improved to 86.9% from 83.5% in the previous year. There were no deaths from minor trauma irrespective of source of admission. This emphasises the importance of inter-hospital transfer guidelines especially in cases of major trauma to expedite delivery of definitive care, reduce the impact of secondary injury, and ultimately improving mortality rate.

Table 10 : Mortality in relation to trauma alerts

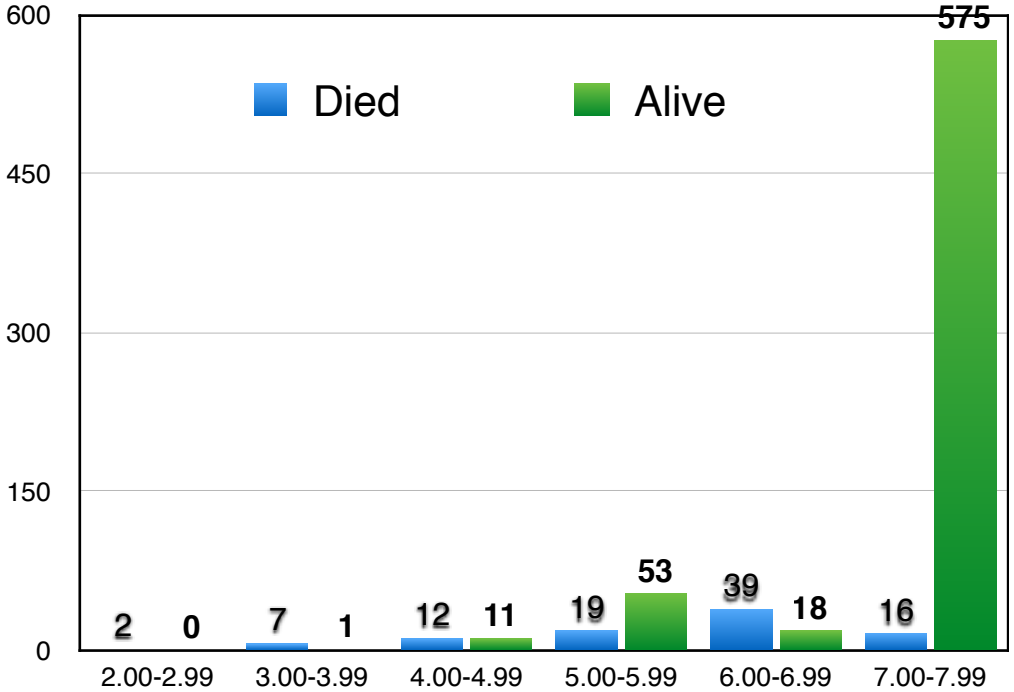
Trauma Alerts	Total deaths	Location of death	N
33	11	ED	0
		OT	3
		ICU	6
		Ward	2

Figure 27 : Outcome of Trauma Alerts



Hospital Sultanah Aminah's trauma team activation system was introduced in Nov 2011. It is two tiered system which is activated by the ED Physician or MO based upon predetermined criteria and predefined work period. There was an improvement in term of mortality rate, whereby 66.7% patients survived the ordeal compared with only 52.9% in the previous year. About 33.3% succumbed to death and most of them died in ICU due to various complications of major trauma and severe head injury. Three cases died in OT as a consequences of massive uncontrolled haemorrhage.

Figure 28 : Outcome by RTS

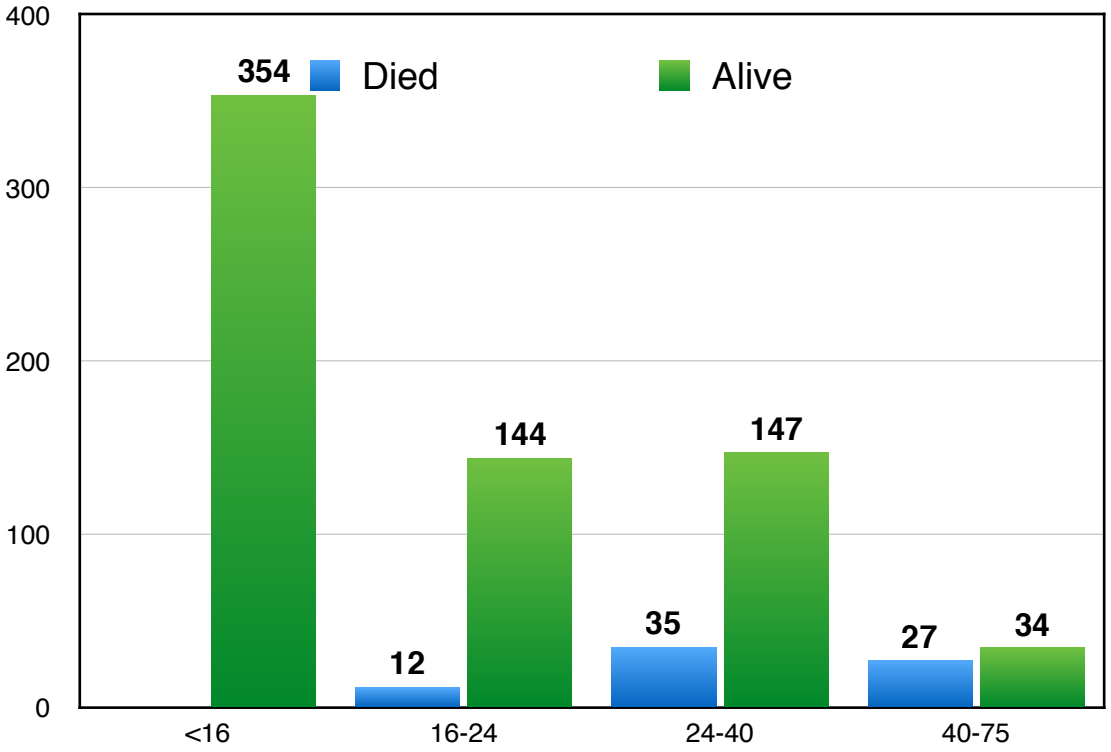


Risk Stratified Mortality based on RTS (Revised Trauma Score)

The distribution of deaths per RTS followed an expected trend with more survivors seen in higher RTS scores. However, the data showed a drop in number of survivors with corresponding deaths doubled in the score range 6.00-6.99.

Outcome by Severity of Injury

Figure 29 : Outcome by Severity of Injury



Major trauma mortality (ISS>15) was 9.8%. *No patients with minor trauma died.* As expected, the mortality increased with increasing injury severity. The mortality of patients with ISS>40 was 44.3%, which showed a slight improvement compared with a report of previous year (46.7%).

Mortality by Mechanism and Severity

Table 11 : Mortality by Mechanism and Severity

Mechanism	Deaths	ISS	Deaths
Blunt	73	< 16	0
		16 - 24	13
		25 - 40	34
		41 - 75	26
Penetrating	1	16	0
		24	0
		25 - 40	0
		41 - 75	1

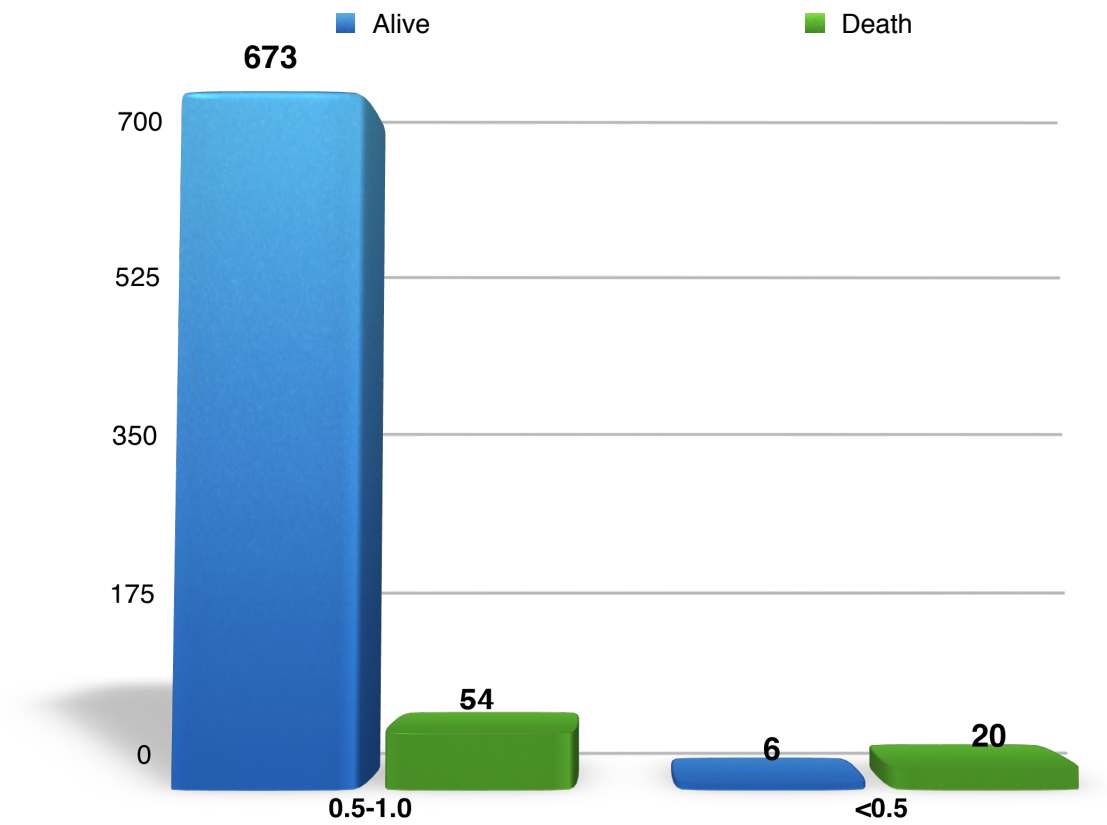
There were 73 deaths resulting from blunt trauma. Only one death resulted from penetrating trauma and sustained severe head, extremity and intraabdominal injuries with an ISS of 41. He succumbed to death as a consequences of massive haemorrhage.

Survival by TRISS

Table 12 : Survival by TRISS

TRISS, Ps	No of patients	Actual deaths	Alive
0.5 - 1.0	727	54	673
< 0.5	26	20	6

Figure 30 : Survival by TRISS



There were 54 unexpected deaths out of 727 patients in the better TRISS scored group. Vice versa, there were six patients who survived from a group of 26 patients who were expected to have died based on the probability of survival calculation.
A subset analysis nto the factors contributing to death in the group of patients who were expected to survive by TRISS calculaions, will be done in the future to identify shortfalls and deficiencies in care. This data will aid in formulating plans in performance improvement programmes for this unit.

Functional Outcomes

Table 13. Functional outcomes

FIM	MEAN	P_{90}	RANGE
Self care	50.2	56	8 - 60
Mobility	31.9	35	5 - 35
Communication	13.3	14	2 - 15
Social cognition	19.9	21	2 - 21

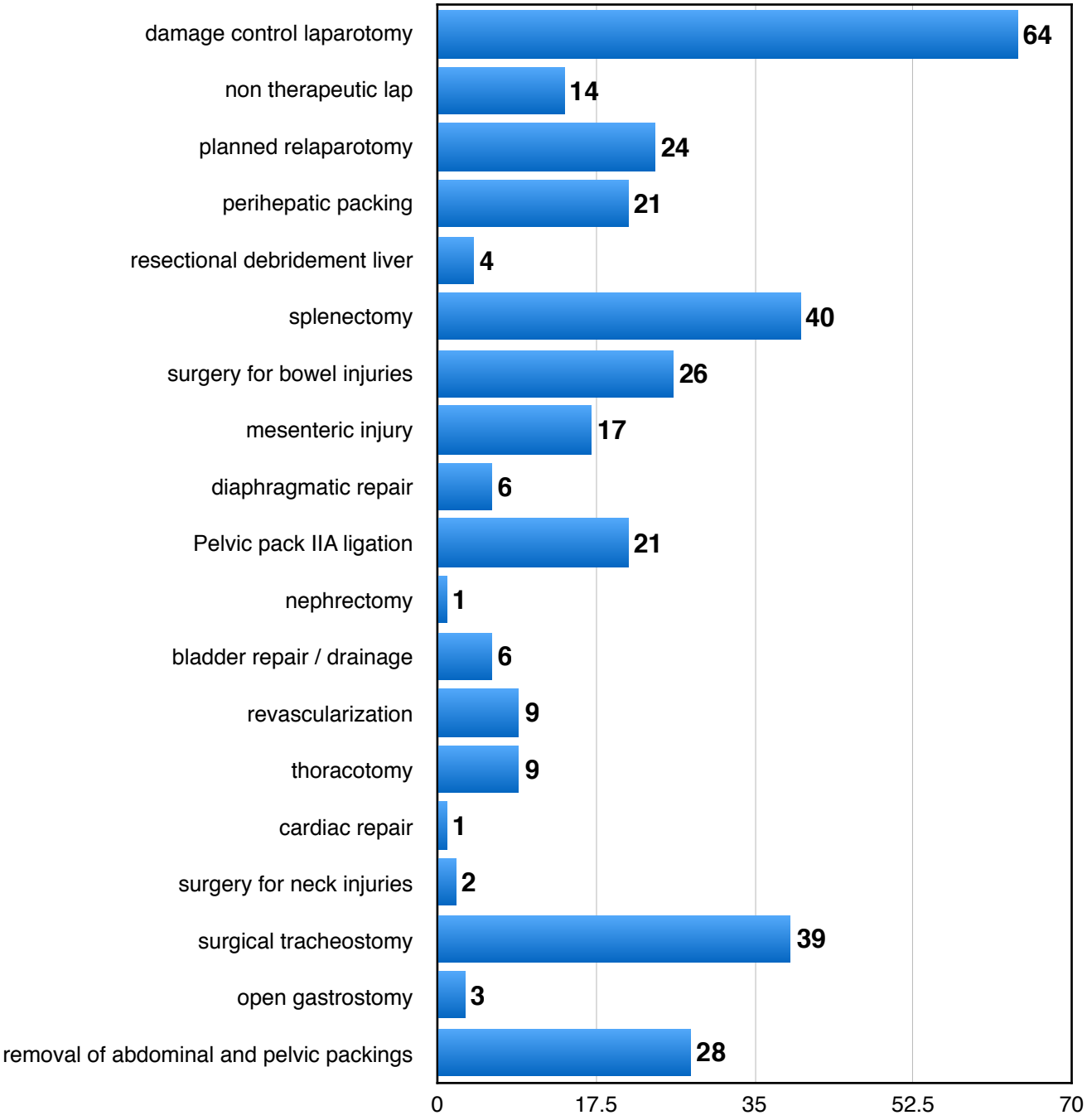
Among the survivors of this trauma registry, FIMS showed good functional outcomes in most areas of assessment. The scores were very similar to the report of previous year.

Part IV. Selected operative procedures

Table 14 : Selected Operative Procedure

Procedure	N
All abdominal procedures	205
Damage control laparotomy	64
Non therapeutic laparotomy	14
Planned second look laparotomy	24
Peri hepatic packing	21
Cholecystectomy	3
Resectional debridement of liver	4
Splenectomy	40
Surgery for bowel injuries (all procedures)	26
Mesenteric tears- haemostasis and repairs	17
Repair of diaphragmatic tears	6
Pelvic packings and iliac vessel ligations	21
Nephrectomy	1
Bladder repair / drainage	6
Revascularization of upper limbs / lower limbs	9
Thoracotomy (all procedures)	9
Cardiac repair	1
Surgeries for neck injuries (all procedures)	2
Surgical tracheostomies	39
Gastrostomy (Open)	3
Removal of abdominal and pelvic packings	28

Figure 31 : Selected Surgical Procedure

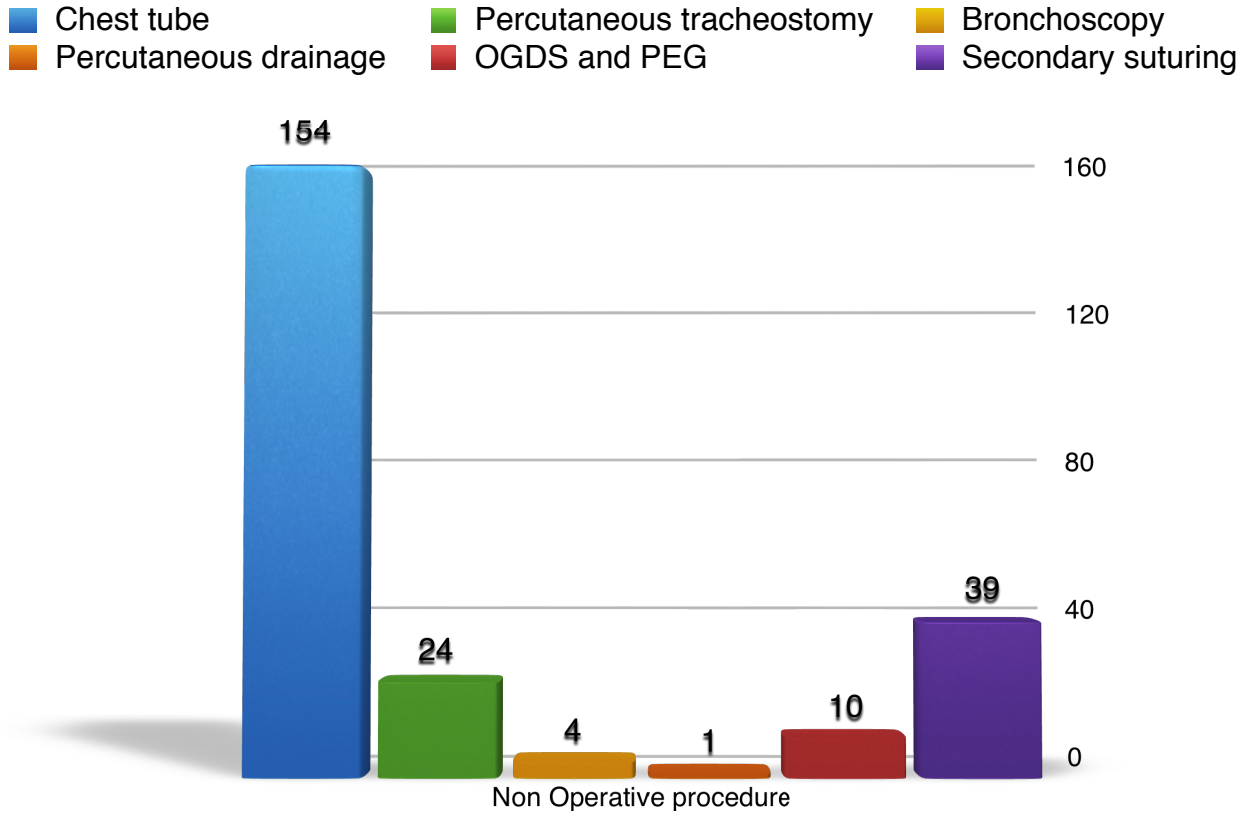


Part V. Selected non operative procedures

Table 15 : Selected commonly performed non-operative procedures

Chest drains/tubes	154
Percutaneous tracheostomy	24
Bronchoscopy	4
Percutaneous drainage, all regions	1
Secondary suturing	39
OGDS and PEG	10

Figure 32 : Selected Non Operative procedure



The most commonly performed procedures was chest tube insertion. This procedure was either done in ED, Emergency theatre or in the general wards by a trained personnel.

Table 16 : Selected intra abdominal solid organ injuries

Organ	N	Operative management (%)	Non operative management (%)
Liver	81	25.9	74.1
Spleen	57	59.7	40.3
Renal	20	20.0	80.0
Pancreas	10	10.0	90.0

Most patients with intra abdominal solid organ injuries were managed non operatively, with the exception of splenic injuries of which about 60% required splenectomies. Pancreatic injury is not as uncommon as previously thought and most of them were managed conservatively during the reported period.

Part VI. Common complications

Table 17 : Common Complications

Complication	N	Admitted to ICU	Not Admitted to ICU
Wound infection	32	28	4
Pneumonia (incl. VAP)	44	33	11
Wound dehiscence	6	2	4
Haematological	32	20	12
Renal failure	21	18	3
Cardiac failure	18	15	3

Complications arising during the course of treatment occurred more frequently in patients who had been admitted to ICU. This most probably reflects the severity of injuries in itself rather than shortfall of the admitting facility, as patients who require ICU care are more likely to have higher injury severity scores, longer stays in hospital and higher mortality. It also explains the most common complication was nosocomial pneumonia, including ventilator associated pneumonia.

Part VII : Organ Injury

Table 18 : Organ Injury

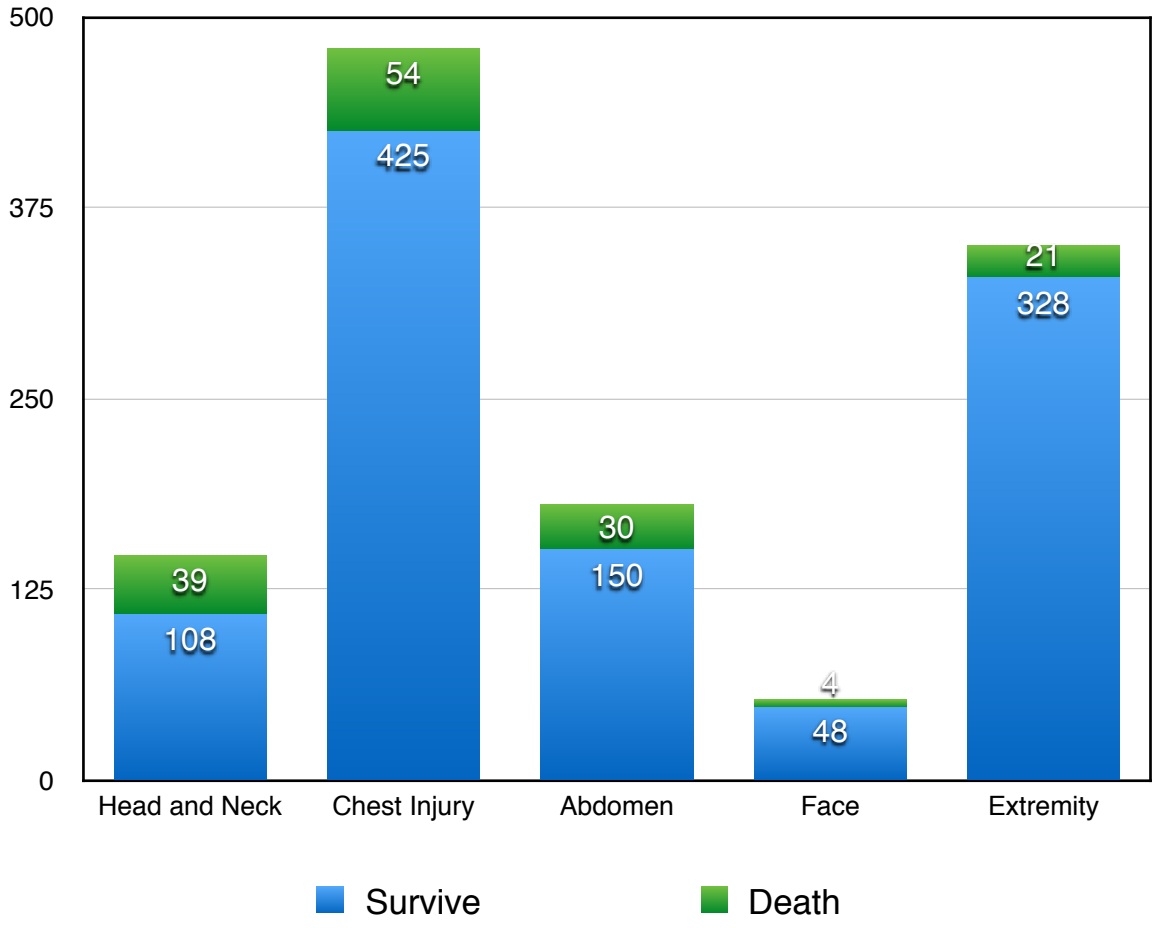
Organ / region	N
head injury	142
face	52
neck	6
heart	3
cervical	10
lumbar	22
chest wall	335
lung	291
thoracic vascular injury	3
diaphragm	7
esophagus	0
stomach	5
liver	81
spleen	57
pancreas	10
small bowel	31
colon	5
rectum	7
adrenal	3
kidney	20
bladder	6
urethra	1
pelvis	32
cervical vascular injury	2
abdominal vascular injury	3
peripheral vascular injury	19
extremity injuries	349

Distribution of injuries based on anatomical regions

Table 19 : Distribution of injuries based on anatomical regions

Regions	Survive	Death *	Total
Head and Neck	108	39	147
Chest	425	54	479
Abdomen	150	30	180
Face	48	4	52
Extremity	328	21	349

Figure 33 : Injuries based on regions



Chest injuries were the most common injury sustained by our patient followed by injuries to the extremities and abdominal injuries.
* These mortality figures are not absolute injuries that contribute to death rather only shows distribution of regions involved.

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